WHAT IS CLAIMED IS:

1. A method for optimizing an LC/MS system comprising an API interface into which a matrix is to be flowed according to a composition gradient profile, the method comprising:

(a) determining a temperature profile according to which a gas is to be flowed into the API interface for vaporizing the matrix, wherein the temperature profile varies the temperature of the gas as the composition of the mobile phase varies along the gradient profile for optimizing vaporization of the mobile phase.

2. The method according to claim 1, wherein the matrix comprises at least two solvents, and determining the temperature profile comprises determining, based on the gradient profile and a flow rate of the matrix into the API interface, a first temperature of the gas for adding heat to the least volatile of the solvents flowing into the API interface, and a second temperature of the gas for adding heat to the most volatile of the solvents flowing into the API interface.

3. The method according to claim 1, wherein determining the temperature profile comprises determining a gradient delay time for the LC/MS system.

4. The method according to claim 3, wherein determining the gradient delay time comprises measuring a period of time required for a gradient composition change in the matrix to reach the API interface.

5. The method according to claim 3, wherein the temperature profile comprises a portion corresponding to the gradient delay time, and the portion has a substantially constant temperature value.

6. The method according to claim 1, comprising determining a flow profile according to which the gas is to be flowed into the API interface, wherein the flow profile varies the gas flow to provide a flow low enough to enable the matrix to enter an evacuated region of a mass spectrometer communicating with the API interface when the matrix comprises an analyte desired for detection by the mass spectrometer, and to provide a flow high enough to prevent the matrix from entering the evacuated region when the matrix does

not comprise an analyte desired for detection.

7. The method according to claim 6, comprising programming an electronic processor-based device to control the flow of the gas into the API interface according to the temperature profile and the flow profile.

8. The method according to claim 6, wherein determining the flow profile comprises determining a first elution time at which a first analyte is to be eluted from an LC column into the API interface.

9. The method according to claim 8, wherein determining the flow profile comprises determining a second elution time at which a last analyte is to be eluted from the column into the API interface, wherein at least a portion of the flow profile generally corresponds to a period from the first elution time to the second elution time.

10. The method according to claim 9, comprising determining an initial elution period during which the mobile phase is flowed through the column generally up to the first elution time, and determining another portion of the flow profile based on the initial elution period.

11. The method according to claim 10, wherein the portion of the flow profile corresponding to the initial flow period has a higher flow value than the portion of the flow profile from the first elution time to the second elution time.

12. The method according to claim 9, comprising determining an additional portion of the flow profile subsequent to the second elution time during which a rinse solvent is flowed through the column and into the API interface for washing the column.

13. A method for operating an LC/MS system adapted for gradient elution, comprising:

(a) flowing an eluent from an LC column into an API interface, wherein the eluent comprises a mobile phase and analytes carried in the mobile phase and separated by the column, and the mobile phase comprises at least two solvents and is flowed through the column according to a gradient profile for varying the

composition of the eluent;

(b) flowing a gas into the API interface for interacting with the eluent; and

(c) controlling the flow of the gas into the API interface according to a gas parameter profile, wherein the gas parameter profile varies a parameter of the gas in accordance with the varying composition of the eluent.

14. The method according to claim 13, wherein controlling the flow of the gas according to the gas parameter profile comprises controlling the flow of the gas according to a temperature profile, and the temperature profile varies a temperature of the gas based on the composition of the eluent flowing into the API interface.

15. The method according to claim 14, wherein controlling the flow of gas according to the temperature profile comprises controlling a heating device disposed in thermal communication with the gas.

16. The method according to claim 13, wherein controlling the flow of the gas according to the gas parameter profile comprises controlling the flow of the gas according to a flow profile, and the flow profile varies a flow of the gas based on the composition of the eluent flowing into the API interface.

17. The method according to claim 16, wherein controlling the flow of gas according to the flow profile comprises controlling a flow control device operatively communicating with the gas.

18. The method according to claim 13, wherein controlling the flow of gas comprising operating an electronic processor-based device to control the flow of the gas according to a gas temperature profile and a gas flow profile.

19. An apparatus for optimizing a chromatographic process for gradient elution, comprising:

(a) an API interface for ionizing a chromatographic eluent of varying composition flowing therein;

(b) a gas conduit for flowing a gas into the API interface for interaction with the eluent; and

(c) a heating control device for controlling a temperature of the gas flowing through the gas conduit according to a temperature profile, wherein the temperature profile varies the gas temperature based on the varying composition of the eluent.

20. The apparatus according to claim 19, comprising a flow control device for controlling the flow of the gas into the API interface according to a flow profile, wherein the flow profile varies the gas flow based on the varying composition of the eluent.

21. The apparatus according to claim 20, comprising an electronic controller for controlling the heating control device and the flow control device in accordance with the temperature profile and flow profile, respectively.

22. The apparatus according to claim 20, comprising a computer program product including computer-executable instructions embodied in a computer-readable medium for controlling the heating control device and the flow control device in accordance with the temperature profile and flow profile, respectively.